UNIVERSITY OF CAMBRIDGE
DEPARTMENT OF HISTORY AND PHILOSOPHY OF SCIENCE

FREE SCHOOL LANE
CAMBRIDGE CB2 3RH
TEL :01223 334540(334556)
FAX:01223 334554

Professor Michael Redhead FBA
Chairman of Department

21·1·96

Dear Gian Carlo,

I have now had time to return to your letter of 6th December and would like to offer the following comments.

There are two crucially distinct readings of $OM - LOC$:

(1) There is the reading which prohibits <u>measurement procedures</u> on the left from affecting <u>measurement outcomes</u> on the right. This is a case by case version of the probabilistic parameter independence, P.I.

This is the reading which is actually used in the derivation of

$$Q.M. \wedge Compl. \wedge (OM-Loc) \supset \neg (EPR-Loc) \quad *$$

P.T.O.

and hence the denial of OM-Loc _in this sense_ can indeed block the derivation of $\neg$(EA-Loc) as we all agree.

(2) But there is a logically stronger sense that prohibits not only setting-to-result effects at space-like separation, but also result-to-result effects (i.e. a case by case version of O.I.)

Now it is crucial for the logical structure of your argument that you use the logically weakest version of OM-Loc that is necessary for the result * to hold. If you use a stronger version than is necessary, you _cannot_ infer that a failure of this _stronger_ version will block the derivation of $\neg$(EA-Loc). That is just a matter of straight logic.

Now in your discussion of the relation between OM-Loc and B-Loc, you are all

the time using Π the stronger version of OM-Loc, since in your examples you refer to the question of whether the outcomes of the two measurements influence one another.

Referring to my previous letter dated 5th November, I was always using the weak version of OM-Loc, and for that version, I maintain that my discussion of the problematics of deriving

$$OM-Loc \supset B-Loc$$

was correct.

I would like now to deal with your Example 3, in which you claim that OM-Loc $\supset$ P.I., requires a No Conspiracy assumption. If Alice selects by some rule when to toss, then she is inducing a place-selection on the random sequence generated by Bob. If this altered the limiting frequency of Bob's results this would contradict the randomness

p.4

of Bob's sequence. But if Bob's sequence really _is_ random, this could not happen!

If you agree with the points in this letter, then I suggest the best way forward would be as follows: I enclose a copy of a _revised_ version of the paper with La Rivière, which I think summarizes my considered point of view on this vital question of the correct relativistic formulation of the EPR argument. I have been asked by Bob Cohen whether I would consider contributing this paper to the Shimony Festschrift he is editing. I would be happy to do this, and then you could raise additional points and comments in a further submission to _Studies in History and Philosophy of Modern Physics_.

I would play no part in the editorial discussion of such a submission.

but would leave this for Jeremy to sort out with you.

I have very much enjoyed, and benifited from, our discussions of this matter.

With very best wishes

Michael

P.S. I should add in relation to your discussion of why the violation of OM-Loc is less serious than the violation of ER-Loc from the relativistic point of view, that you again use the _strong_ version of OM-Loc, when you talk, for example, of a "violation of OM-Loc — due to a violation of O.I."